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Public Health Reports

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TANNIC ACID TREATMENT OF POISON IVY (RHUS SPP.) DERMATITIS

By Louis Schwartz, *Medical Director*, and Leon H. Warren, *Acting Assistant Surgeon (Dermatology)*, *United States Public Health Service* [1]

The many substances proposed for the treatment of poison ivy dermatitis do not differ essentially from those used in the treatment of any acute vesicular dermatitis, except that oxidizing agents such as potassium permanganate have been advocated with a view to oxidizing and thus rendering nonirritant the active principle of the plant. Recently the authors found that oxidizing agents are also useful as preventives (*1*). In addition to oxidizing agents the medicaments commonly used for the treatment of poison ivy dermatitis include calamine lotion, lead acetate, zinc sulfate, sodium hyposulfite, aluminum acetate, boric acid, etc.

In a search of the literature no reference has been found to tannic acid recommended specifically in the treatment of poison ivy dermatitis, although Sulzberger and Wolfe (*2*) and Warren (*3*) include among a list of other wet dressings 2 to 5 percent tannic acid solution for the treatment of vesicular dermatitis (eczema).

The dermatitis caused by poison ivy and many other plants manifests itself, in most instances, as a vesicular eruption. The vesicles vary in size and may become large bullae resembling second-degree burns. Tanning with tannic acid of the opened blisters of burns is accepted as one of the best forms of treatment, and it seemed to the authors that it might be applicable in the treatment of opened vesicles and bullae of plant dermatitis.

As this procedure was decided upon late in the poison ivy season, there has been opportunity to test it on only 11 patients having dermatitis presumably caused by poison ivy. Of the 11 patients treated, one failed to return for final observation. The itching and discomfort stopped within 1 or 2 days after beginning treatment in 9 of the patients, and all had recovered at the end of 1 week. The tenth case, which was suspected of having been caused by crab grass (*Syntherisma*

[1] From the Division of Infectious Diseases, National Institute of Health.

sanguinalis, reported by Shelmire to be a cause of dermatitis) and not by poison ivy, was symptomatically well in 10 days but the remains of the eruption (consisting of crusts and pigmentation) were present at the end of 2 weeks.

The first patient whom we treated had an eruption limited to the calf of the leg. The dermatitis had been present for 2 weeks, but was still itching and exhibited erythema, small vesicles, and scratch marks; the eruption had been treated ineffectually with calamine lotion containing phenol. The area was rubbed vigorously with a piece of gauze soaked in 95 percent alcohol, removing the tops from the vesicles. The alcohol was then allowed to evaporate, leaving an oozing surface. The serum was wiped off with gauze and a 10-percent aqueous solution of tannic acid was painted on. This was allowed to dry for one-half hour and another application was made and allowed to dry. The patient was given a 2-ounce bottle of the 10-percent tannic acid solution and directed to apply the solution to the eruption twice daily. He was also told that if any new vesicles appeared these were to be rubbed with alcohol until the tops were rubbed off, when the tannic acid solution should be applied. The patient returned the next day with the lesion completely crusted over with a thin adherent crust and the subjective symptoms gone (fig. 1). No new vesicles had appeared, and in 1 week's time the crust had fallen off and the skin had become normal.

The eruptions in the other cases were more extensive, involving the face and extremities. It was thought that instead of painting on the tannic acid solution it might better be applied as wet dressings after the tops of the vesicles had been rubbed off with alcohol-saturated gauze or the tops clipped off with scissors. Patients were instructed to rub off the tops of any new vesicles and to apply the wet dressings daily for one-half-hour periods. No dressing was used after the compress had been applied. In only one of these cases did the pruritus fail to respond to a few applications of tannic acid solution. In this case the addition of 3 percent phenol to the wet dressing stopped the itching. Phenol itself is a protein coagulant and tanning agent. It is suggested that in cases where the pruritus is so severe that the tannic acid does not relieve it, phenol 1 to 3 percent may be added to the solution. In extensive cases not more than 1 percent of phenol should be used for compresses on account of the danger of systemic absorption. In such case the patient should be under the observation of the physician for signs of systemic absorption and poisoning by phenol—dark smoky urine, diarrhea, colic, and myosis. In cases having blisters of sufficient size, it is suggested that they be opened or the tops be clipped off and alcohol applied and allowed to evaporate before the tannic acid solution is applied (fig. 2).

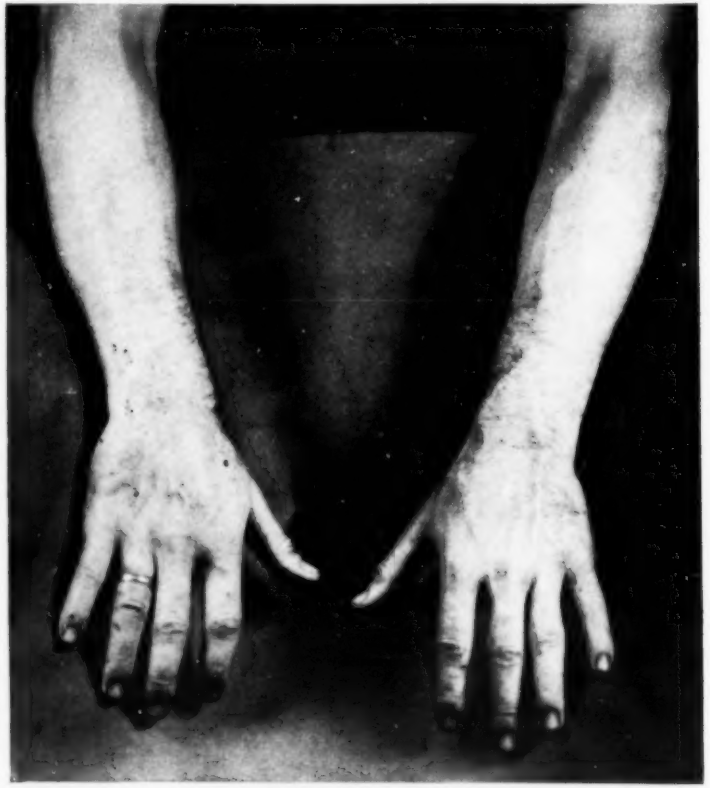

FIGURE 1.—Vesicles treated with tannic acid solution after their tops had been removed by rubbing.

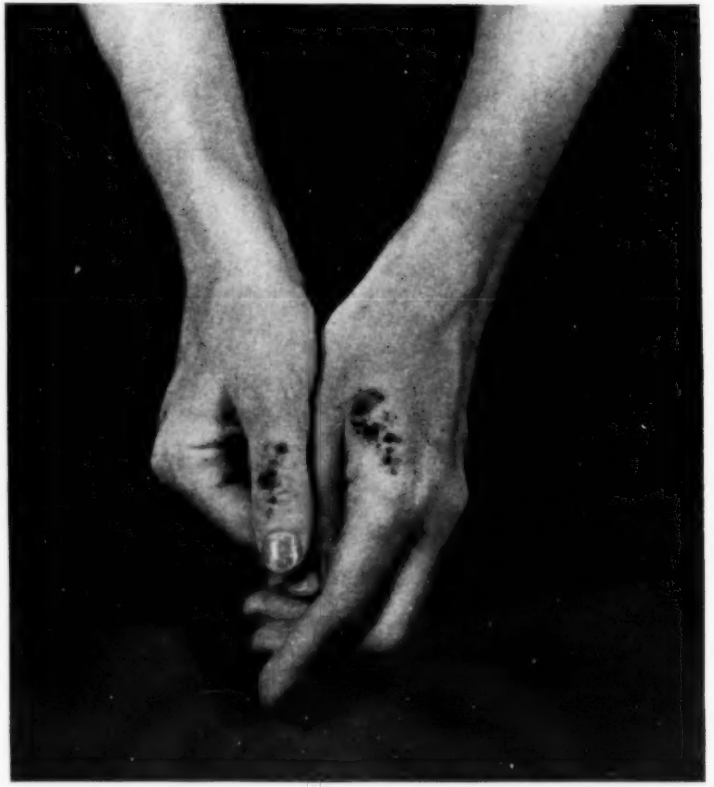

FIGURE 2.—Blebs treated with tannic acid solution after their tops had been removed with scissors.

In two of the cases treated, the lesions on one side of the body were treated with another tanning agent, 10 percent aluminum sulfate, but it was less efficacious than the tannic acid solution.

This treatment is reported in the hope that other physicians will give it a trial, and either confirm or disprove the efficacy of this treatment on a larger number of patients.

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STUDIES ON IMMUNIZING SUBSTANCES IN PNEUMOCOCCI[1]

XII. COMPARISON OF THE EFFECT OF WHOLE-CELL VACCINE AND OF POLYSACCHARIDE ANTIGEN IN HUMAN BEINGS

By Lloyd D. Felton, *Senior Surgeon, United States Public Health Service;* Carl F. Jordan, *Director, Division of Preventable Diseases, Iowa State Department of Health;* E. N. Hesbacher, *Director, Polk County (Iowa) Health Service;* and Ellis K. Vaubel, *Assistant Director, Division of Preventable Diseases, Iowa State Department of Health*

In recent studies on antibody production in man following the injection of an antigenic polysaccharide of the pneumococcus, a great individual variation was observed in this trait (*1*). This variation in response to the same dose of antigen was so great as to suggest the

[1] From the Division of Infectious Diseases, National Institute of Health, Washington, D. C., and the State Department of Health of Iowa. This is one of a series of studies carried out in part under a grant from the Influenza-Pneumonia Commission of the Metropolitan Life Insurance Co.

Preceding papers in the series on studies on immunizing substances in pneumococci are:

I. Active immunization of white mice by a nonpolysaccharide and probably nonprotein derivative of the pneumococcus. By L. D. Felton. J. Immunol., **23**: 405 (1932).

II. Separation of the organism into acid soluble and acid insoluble fractions. By L. D. Felton. J. Immunol., **27**: 379 (1934).

III. The precipitation of bacterial polysaccharides with calcium phosphate; pneumococcus. By L. D. Felton, G. Kauffmann, and H. J. Stahl. J. Bact., **29**: 149 (1935).

IV. Antigenic characteristics in man of certain products of the pneumococcus. Comparison with vaccine. By L. D. Felton, W. D. Sutliff, and B. F. Steele. J. Infect. Dis., **56**: 101 (1935).

V. The effect of alkalis on the immunizing properties of a type I pneumococcus polysaccharide. By L. D. Felton and B. Prescott. Bull. Johns Hopkins Hosp., **59**: 114 (1936).

VI. The essential immunizing antigen of types I and II pneumococci. By L. D. Felton and G. Kauffmann. Bull. Johns Hopkins Hosp., **62**: 430 (1938).

VII. Response in human beings to antigenic pneumococcus polysaccharides, types I and II. By L. D. Felton. Pub. Health Rep., **53**: 1855–1877 (1938).

VIII. Report on field tests to determine the prophylactic value of a pneumococcus antigen. By G. M. Ekwurzel, J. S. Simmons, L. I. Dublin, and Lloyd D. Felton. Pub. Health Rep., **53**: 1877–1893 (1938).

IX. Cutaneous tests in nonimmunized and immunized individuals in relationship to serum antibody content. By L. D. Felton and P. F. Prather. Pub. Health Rep., **54**: 1053–1070 (1939).

X. The relationship between the acetyl group on type I pneumococcus polysaccharide and antigenicity. By L. D. Felton and B. Prescott. J. Bact., **38**: 579–593 (1939).

XI. Effect of variation in dosage of antigenic polysaccharide on serum antibody titer in human beings. By L. D. Felton, W. R. Cameron, and P. F. Prather. Pub. Health Rep., **56**: 822 (1941).

possibility that susceptibility or nonsusceptibility may be related to this individual characteristic. The response was observed to vary at least a millionfold, as measured by the number of lethal doses against which mice would be protected with 0.1 cc. of serum from those immunized. In other words, those who can manufacture antibody readily may be resistant, whereas those unable to do so, or able only to slight degree, may be susceptible to this infection. The latter group represents the real problem in a program directed toward prevention of pneumonia by active immunization. Yet if the above assumption be true, and if it is found possible to separate the general population into nonsusceptible and susceptible groups, then a practical program of prophylaxis may become feasible, for those who respond but poorly represent only 10 to 15 percent of the general population.

Again, such a program would be successful only if a method of immunizing the susceptible group could be discovered. So far endeavors to stimulate antibody production in those found to be poor reactors in previous tests have been of little avail. Obviously, unless there is an unknown type of response from an antigen resulting in an increase in host resistance, protection against pneumonia rests on the host's ability to manufacture serum antibody. From this standpoint it becomes necessary to find either a better method of application or an antigen which will stimulate serum antibody in all alike. Should this be impossible, then a study of host factors which influence the production of serum antibody must be made. There are these two possibilities, but they are not considered all-inclusive.

Thus far our work has been limited mostly to the antigenic form of the pneumococcus polysaccharide. Although preliminary studies have been made to compare this antigen with the whole cell vaccine (*2*), insufficient numbers were investigated to make significant deductions. For that reason, an attempt has been made to compare in human beings the relative activity of the antigenic polysaccharide and the whole-cell vaccine. Two main points are to be emphasized: First, a comparison of the variation in individual capacity to manufacture antibody from these two antigens; and, second, an answer to the query as to whether a second injection of the whole-cell vaccine will stimulate a higher titer of antibody in good reactors and result in a decrease in the number of individuals in the poor-reactor group.

MATERIALS

Two whole-cell vaccines were made from type I and type II organisms in the following manner: Type I pneumococci were inoculated, 10 percent by volume, into 800 cc. of a 2 percent peptone meat infusion broth to which 0.2 percent dextrose had been added. After incubation at 37° C. for 8 hours, the organisms were killed with 0.4 percent formaldehyde, stored in the ice box overnight, and then col-

lected at high speed in a refrigerating centrifuge. The sedimented organisms were washed with physiologic salt solution and centrifugalized at high speed (5,800 r. p. m.) in an angle centrifuge at room temperature. The volume was 40 cc. Half the amount, 20 cc., was then suspended in c. p. acetone, held at room temperature overnight, filtered, washed with acetone, and dried in a vacuum desiccator. A similar procedure was followed for type II. These acetone-dried organisms were then weighed (type I=124 mg., type II=158 mg.) and made into a vaccine containing 1 mg. per cc. of each type, I and II, in physiologic salt solution with 0.25 percent phenol added as preservative. The total number of organisms of the combined types was then 1,710,000,000 per cc. The 20 cc. of wet organisms were suspended in salt and diluted until there was approximately this same number of organisms to a cubic centimeter (count was 1,800,000,000). The preparation of acetone-dried organisms was designated lot No. 3, and the nondried, lot No. 4. This small dose of vaccine (2 mg. per cc.) was used in an attempt to avoid the usual severe reactions following injection of whole-cell vaccines. However, even with this dose some severe reactions followed the injection of the wet vaccine, to such degree that only 29 individuals were immunized with this preparation. On the other hand, little untoward effect was observed following the use of the acetone-dried organisms. Previously, with other vaccines dried in this way, as much as 5 mg. (9,000,000,000 organisms) have been injected in one dose without causing any inconvenience to the person injected (*3*).

For the polysaccharide antigen, sufficient dried material prepared by the calcium phosphate method (*4*) was weighed to make 0.8 mg. type I and 0.4 mg. type II per cc., and was dissolved in physiologic salt solution, to which was then added 0.25 percent phenol. This amount of this particular antigen, No. 29, was chosen arbitrarily because in human beings it stimulated optimum response as measured by production of serum antibodies. The clear solution was then filtered through a Seitz pad and ampouled. Both vaccines and polysaccharide antigen were tested for sterility and showed no growth after 10 days.

A description of both vaccine and polysaccharide preparations and their antigenicity for white mice is given (tables 1 and 2). It is seen that a single intraperitoneal injection of 0.5 cc. of a 1:100 dilution of the vaccine preparation which contained 1 mg. of each type per cc. (=0.005 mg. type I) immunized mice in 7 days to such degree that they withstood a million lethal doses of virulent organisms of type I. That is true for both vaccines Nos. 3 and 4. This same dose of vaccine immunized mice so that they withstood 500,000 lethal doses of type II. The specific polysaccharide preparations were tested before combining the two types into lot No. 29. For assay

of their antigenicity, mice in groups of 10 were injected once with 0.5 cc. of a 1:1,000,000 dilution (0.0005 mg.), and 7 days later tested for protection against 5,000, 50,000, 500,000, and 1,000,000 lethal doses. With both types, mice were found to be immune against a million lethal doses. If an "immunizing dose" is considered to be that quantity of antigen necessary to immunize mice against a million lethal doses, then 1 mg. of each type contains 2,000 immunizing doses. Hence, lot No. 29 used in human beings, comprising 0.8 mg. type I and 0.4 mg. type II per cc., contained 800 and 400 mouse immunizing doses, respectively, in the 0.5 cc. dose injected. Similarly calculated, vaccine No. 3 in 0.5 cc. dose contained 100 and 50 mouse immunizing doses, respectively, of each type.

TABLE 1.—*Titration of pneumococcus vaccine in white mice. All mice received injection of 0.5 cc. of the specified dilutions of a 6-hour autopsy culture*

Vaccine lot (dil.=1:100)	Number of survivals of 10 vaccinated mice							
	Type I culture dilutions				Type II culture dilutions			
	1:500		1:1,000	1:10,000	1:500		1:1,000	1:10,000
No. 3	6		8	10	3		5	7
No. 4	6		8	8	2		5	7
	Survival time of nonvaccinated mice							
	10^{-6}	10^{-7}	10^{-8}	2×10^{-9}	10^{-6}	10^{-7}	10^{-8}	2×10^{-9}
Control	[1] 22	22	22	24	22	22	22	22
	22	22	22	24	22	22	22	24
	22	24	24	S	22	48	24	S

[1] Numbers refer to hours of survival, S indicates survival.

TABLE 2.—*Polysaccharide antigen No. 29. Description of materials before combining*

Type	Nitrogen	Glucose number	Optical rotation	Precipitin titer	Immune precipitable nitrogen				
					1:2,500	1:5,000	1:10,000	1:15,000	1:20,000
	Percent	*Percent*	*Degrees*						
I	2.95	11.70	+140	1:5,000,000	------	0.646	0.532	0.470	0.358
II	1.76	56.16	+55	1:5,000,000	0.314	.304	.272	.272	.244

TABLE 2—Continued

Titration in white mice. All mice received injection of 0.5 cc. of the specified dilutions of a 6-hour autopsy culture

	Number of survivals of 10 inoculated mice							
	Type I culture dilutions				Type II culture dilutions			
	1:500	1:1,000	1:10,000	1:100,000	1:500	1:1,000	1:10,000	1:100,000
Polysaccharide (1:1,000,000)	6	8	9	10	5	9	9	10
	Survival time of noninoculated mice							
	10^{-6}	10^{-7}	10^{-8}	2×10^{-9}	10^{-6}	10^{-7}	10^{-8}	2×10^{-9}
Control	[1] 22	22	22	22	18	18	18	20
	22	22	22	24	18	18	18	24
	22	22	24	S	18	18	20	S

[1] Numbers refer to hours of survival, S indicates survival.

PROCEDURE FOR STUDY IN HUMAN BEINGS

The study in human beings was made on institutionalized, ambulatory persons. Those injected with the polysaccharide antigen received a single dose of 0.5 cc. subcutaneously With the whole-cell vaccine, there were two injections—the dose for the first was 0.25 cc. and for the second, 14 days later, 0.5 cc. To test for serum antibody, blood was withdrawn before and from 14 to 21 days after injection of the polysaccharide antigen, and similarly before and 14 days after the first injection and again from 14 to 21 days after the second injection of the vaccine. The serums were studied for protective antibodies in mice by a method the details of which are given elsewhere (*5*). In addition, Francis-Tillett skin tests (*6*) were carried out prior to and 14 days after injection of each dose of either polysaccharide or vaccine.

RESULTS WITH VACCINE

A summary of the results of the use of vaccine is shown in table 3. It includes sections A and B, showing the results in persons whose serums were titrated before and after only one injection of lots Nos. 3 and 4 vaccine, respectively; and section C, giving the results in 79 individuals on whom serum tests were done before and after each of two injections with either vaccine, irrespective of the mode of preparation. Because of the small number in each group, those individuals whose serums (0.1 cc.) protected against only one lethal dose and those not protected at all are tabulated together, and similarly those protected against 10 and 100 lethal doses, 1,000 and 10,000, and against 100,000 and 1,000,000 lethal doses.

TABLE 3.—*Results of immunization of human beings with whole-cell vaccine*

Type	Total number	Persons whose serums protected against following lethal doses							
		Numbers lethal doses [1]				Percent lethal doses [1]			
		0-1	10-100	1,000-10,000	100,000-1,000,000	0-1	10-100	1,000-10,000	100,000-1,000,000
	A. Lot No. 3								
I. Before injection	63	60	2	1	0	95.2	3.2	1.6	0
After injection	61	8	10	32	11	13.1	16.4	52.5	18.0
II. Before injection	63	48	8	6	1	76.2	12.7	9.5	1.6
After injection	60	2	2	33	23	3.3	3.3	55.0	38.3
	B. Lot No. 4								
I. Before injection	29	23	3	3	0	79.3	10.3	10.3	0
After injection	29	5	1	17	6	17.2	3.4	58.6	20.7
II. Before injection	29	25	1	2	1	86.2	3.4	6.9	3.4
After injection	29	1	5	13	10	3.4	17.2	44.8	34.5
	C. Combined results, lots No. 3 and No. 4, including all who received a second injection								
I. Before injection	79	73	5	1	0	92.4	6.3	1.3	0
After first injection	79	13	12	44	10	16.5	15.2	55.7	12.6
After second injection	79	11	16	41	11	13.9	20.3	51.9	13.9
II. Before injection	79	64	8	5	2	81.0	10.1	6.3	2.5
After first injection	78	3	4	45	26	3.8	5.1	57.7	33.3
After second injection	79	4	7	31	37	5.1	8.9	39.2	46.8

[1] Lethal doses against which 0.1 cc. serum protects mice.

Although in the two groups injected once with lots Nos. 3 or 4 whole-cell vaccine, there was a difference in the percentage of individuals who had serum antibodies prior to inoculation, the difference in response stimulated by the two preparations was slight. In other words, in consideration of the individual variation, the acetone-dried organisms were as efficient antigenically as the wet organisms from which they were prepared. On the other hand, while no severe reactions followed injection of the acetone-dried vaccine, the wet vaccine produced sufficient untoward reactions to limit its use to 29 individuals. In section C are shown the results after first and second inoculations of 79 individuals. The number of individuals was less than in sections A and B together, owing to the fact that some did not receive a second injection. In this group there is little evidence that a second injection stimulated additional serum antibodies. In the case of type I, whereas only 3 in the group increased as much as one hundredfold in antibody titer, 5 showed a decrease to this extent. Furthermore, there were 13 persons who were negative after the first injection, of whom only 3 responded to a second injection. One of these gave antibody titer such that 0.1 cc. serum protected against 10 lethal doses, and 2 were protected against 100 lethal doses. On the

other hand, with type II, 7 individuals showed a one hundredfold increase after the second injection, while 10 showed a decrease to this same degree, and 2 individuals failed to respond to either the first or second injection. It would thus appear that with the present whole-cell vaccine one injection stimulates serum antibody as effectively as two spaced as they have been in this study, 14 days apart. The slight differences noticed might well be due to the lack of sensitivity of the present method of assay. Certain numbers of individuals were unable to manufacture serum antibody from a dose of antigen to which a majority of those tested responded well but to varying degree.

COMPARISON WITH POLYSACCHARIDE ANTIGEN

In the case of the polysaccharide antigen, only one immunizing injection was made because it was found previously that there is no apparent advantage in a second dose, at least when given 2 weeks later. Data on this subject are being published elsewhere (*7*). The findings on the serum antibody tests on the 92 individuals included in the present study are summarized in table 4 and, as may be seen, are similar to those in previous studies (*1*). However, since the purpose of this investigation is to make a comparison of antigen and whole-cell vaccine, the results of these tests will be discussed in connection with those shown in the previous table.

TABLE 4.—*Results of immunization of human beings with polysaccharide antigen lot No. 29*

Type	Total number	Persons whose serums protected against the following lethal doses [1]							
		Number				Percent			
		0–1	10–100	1,000–10,000	100,000–1,000,000	0–1	10–100	1,000–10,000	100,000–1,000,000
I. Before injection	92	72	15	5	0	78.3	16.3	5.4	0
After injection	92	10	27	37	18	10.9	29.3	40.2	19.6
II. Before injection	92	67	14	8	3	72.8	15.2	8.7	3.3
After injection	92	4	5	42	41	4.3	5.4	45.6	44.6
	Results in larger group for comparison [2]								
I. Before injection	1,099	935	113	46	5	85.1	10.3	4.2	0.5
After injection	1,099	89	189	561	260	8.1	17.2	51.0	23.6
II. Before injection	1,098	905	129	56	8	82.4	11.7	5.1	.7
After injection	1,097	18	104	535	440	1.6	9.5	48.8	40.1

[1] Lethal doses against which 0.1 cc. serum protects mice.
[2] From Am. J. Pub. Health, 30: 361–368 (1940).

Although there is a difference in the percentage of individuals in the two groups who were negative before immunization, the percentage of those who failed to respond to type I was less with the antigen (10.9 percent) than with the vaccine (16.5 percent). With type II,

the percentage who failed to respond was practically the same, 4.3 and 3.8 percent, respectively, for antigen and vaccine. The numbers in the groups are too small to make a detailed analysis. Yet it should be pointed out that the largest group in both cases is that in which 0.1 cc. serum protects against 1,000 to 10,000 lethal doses; with type I this group comprises 55 percent of the total of those receiving vaccine and 40 percent of the total of those receiving polysaccharide antigen; and with type II the groups are 57 and 45 percent, respectively. However, this is counterbalanced by the fact that, whereas serum of only 12 percent of those vaccinated protected against 100,000 to 1,000,000 lethal doses, 19.6 percent of those receiving soluble antigen were of this titer; with type II the corresponding percentages were 33 and 44 percent, respectively. Hence it may be concluded at present that the serum antibody response in human beings with a given dose of either whole-cell vaccine or antigenic polysaccharide is similar if not identical. The variation in response is due not to the antigen but to the capacity of the individual to manufacture antibody to pneumococcus antigen.

The results obtained with the use of polysaccharide antigen in this group of individuals compare favorably with those already published (*1*) in which tests were reported on the serums of more than 1,000 individuals before and after immunization with polysaccharide antigen. With type I the percentage of this group without serum antibody before immunization differed only slightly from that of the large group, 78 and 85 percent, respectively. Also, after immunization, the percentage of those who failed to respond was similar, 10.9 and 8.1 percent. In like manner, with type II the percentages without antibody were, respectively, before injection 72.8 and 82.4 percent, and after immunization, 4.3 and 1.6 percent. Thus the present results would seem to be what might be expected with such an antigen. However, the important consideration is the great variation in the capacity of different individuals to manufacture serum antibodies.

RESULTS OF SKIN TESTS

The Francis-Tillett skin test was carried out before and after injections on all those immunized with either vaccine or polysaccharide antigen. Reactions were classified in the manner reported by Felton and Prather (*8*). Comparison was made of the four possible relationships between skin tests and serum antibody, namely both tests positive, i. e., the degree of correlation between antibody and positive skin test; both tests negative; negative antibody with positive skin test; and positive antibody with negative skin test. The first and last are perhaps the most important. Before summarizing the results, it should be stated that about 80 percent of the individuals in these groups were 40 years of age or above, and consequently the results of

the skin tests may not be representative of those found in an average population of different age groups. In the case of the vaccine, before injection of the first dose, the number positive in both tests was relatively low, 22 percent for type I and 5 percent for type II. After immunization with a single injection, 78 percent were positive for type I and 64 percent for type II in both tests, serum antibody and skin reaction (table 5). After the second injection, 79 percent were positive for type I and 58 percent for type II. If comparisons are made between positive serum-positive skin and positive serum-negative skin reactions, then 5 percent of the type I and 32 percent of the type II who had protective serum antibody were missed by the skin test. The percentage of those negative in both tests after a single dose of vaccine was only 2.5 percent with either types I or II. The largest discrepancies were in the serum negative-skin positive with type I and serum positive-skin negative with type II. Such discrepancy might be due in part to the particular immunizing or skin test antigen, or immunological and physical variations of the individual, "physical" here referring particularly to the texture of the skin. Again inasmuch as the immunizing antigens used gave similar antibody responses and one skin test antigen was used throughout, it is possible that the lack of reactivity here may have been due to the large proportion of individuals in higher age brackets.

TABLE 5.—*Correlation of skin reaction and serum antibody following vaccine injections*

Type	Total number	Number of persons				Percent			
		+serum +skin	+serum −skin	−serum +skin	−serum −skin	+serum +skin	+serum −skin	−serum +skin	−serum −skin
I. Before injection	79	18	7	38	16	22.8	8.8	48.1	20.3
After first injection	79	62	4	11	2	78.5	5.0	13.9	2.5
After second injection	79	63	5	10	1	79.7	6.3	12.6	1.2
II. Before injection	79	4	27	14	34	5.0	34.2	17.7	43.0
After first injection	77	50	25	0	2	64.9	32.5	0	2.6
After second injection	79	46	29	3	1	58.2	36.6	3.8	1.3

"+serum"=antibodies present in blood, "−serum"=antibodies absent in blood.
"+skin"=positive skin reaction, "−skin"=negative skin reaction.

It would appear that the results obtained on individuals immunized with polysaccharide antigen are somewhat better than those obtained with whole-cell vaccine for, as seen in table 6, with type I the positive skin tests on individuals with positive serum antibodies comprised 89 percent, with 7.6 percent having positive serum and negative skin reactions. This latter percentage with type I compares satisfactorily with the result of 5 percent with vaccine. With type II, however, 73 percent had positive serum and positive skin reactions, and 22 percent with positive antibody showed no skin reaction, as contrasted with 32 percent in vaccine-treated individuals. Thus, the antigenic

polysaccharide in the dose used is equal, if not somewhat superior, to whole-cell vaccine in the degree of correlation between the skin test and serum antibody content. The problem still remains to be solved as to what modification of skin test antigen may be used to increase the sensitivity of the Francis-Tillett test so that it is possible to separate with a greater degree of accuracy individuals whose serums either do or do not contain protective antibody.

TABLE 6.—*Correlation of skin reaction and serum antibody following injection of polysaccharide antigen*

Type	Total number	Number of persons				Percent			
		+serum +skin	+serum −skin	−serum +skin	−serum −skin	+serum +skin	+serum −skin	−serum +skin	−serum −skin
I. Before injection	92	20	9	45	18	21.7	9.8	48.9	19.6
After injection	92	82	7	3	0	89.1	7.6	3.2	0
II. Before injection	92	7	40	10	35	7.6	43.5	10.9	38.0
After injection	92	67	21	2	2	72.8	22.8	2.2	2.2

"+serum"=antibodies present in blood, "−serum"=antibodies absent in blood.
"+skin"=positive skin reaction, "−skin"=negative skin reaction.

DISCUSSION

The present study provides additional data on the relationship between antigenicity in mice and in man. In a previous report (*7*) on the optimum dose of a polysaccharide antigen in man as measured by protective serum antibody content, the antigen used was of low activity for mice; yet the results were apparently as good as those reported here in which the polysaccharide was one hundredfold more antigenic for mice. In addition, small numbers of individuals have been tested with polysaccharide nonantigenic for mice which apparently caused as good a response as either of these two antigens. This is a confirmation of the results obtained by Francis (*9*) with a polysaccharide rendered inactive for white mice by treatment with alkali. It is difficult to conceive of such a possibility with whole-cell vaccine, that is, an organism nonantigenic for mice yet fully antigenic for man. However, it is general practice in the production of pneumococcus antibody to choose an organism which stimulates the highest antibody titer in the animal species used. Obviously more work must be done to establish, if possible, tests which may insure the use of an active vaccine for human beings in hope of increasing resistance to pneumococcus or other bacterial species. So far as it has been observed by us, polysaccharide antigen either nonantigenic or active for mice is highly antigenic for man. The reverse is not true with the polysaccharide.

Prior to recent studies, little work has been done on the actual measure of antigenicity of pneumococcus vaccine, or, as a matter of fact, any bacterial vaccine, before its use on human beings. It is

apparently believed by many investigators that the injection of the whole bacterial cell will be followed by increased resistance of the host whether or not serum antibodies are developed. Efforts have been made by some to assure activity by taking into consideration the dose, the number of injections, and the interval, and to some extent the antigenicity of the vaccine used. The experiment in the Rand in South Africa, initiated by Sir Almroth Wright, is perhaps the first good example (Lister (*10*)). He used opsonic index as a measure of individual response to a given antigen. The degree of correlation between this index and the amount of protective antibody as a means of increasing resistance in human beings is not known. It is of importance to quote the conclusion of Lister in regard to response as measured by opsonic titer following repeated injections of their pneumococcus vaccine: "Antibody formation is greatly increased after a second inoculation and rises to a still higher degree after a third inoculation."

More recently, Cecil and Austin (*11*) reported an evaluation of vaccine in 42 human beings, prior to immunization of a large group, by injecting repeated doses of different amounts. In all they reported tests on 42 individuals, 32 with doses varying from 34 billion of each type to 2.5 billion organisms, at intervals varying from 1 to 7 days, with the number of injections varying from 2 to 7. Since it has been demonstrated by us that there is a very great individual variation in capacity to manufacture antibody, it is doubtful whether with the small number of individuals studied a significant conclusion may be drawn from their report. It is of interest to summarize their results according to the number of individuals whose serums protected against 0, 100, 1,000, and 10,000 lethal doses. With type I, 7 failed to respond, 10 protected against 100, 13 against 1,000, and 2 against 10,000 lethal doses; with type II, 4 failed to respond, 10 protected against 100, 16 against 1,000, and 2 against 10,000; with type III, 26 failed to respond, 4 responded against 100, and 2 against 1,000 lethal doses. In comparison with work reported above, the antigen used by them in very large doses and with repeated injections gave a response inferior to that from a single injection of 250 million organisms each of types I and II. These investigators also injected 8 individuals with a single dose of 8 billion organisms of each type, I, II, and III; 2 failed to respond to type I and 5 to type III; all the others responded but with the highest titer protection by 0.2 cc. serum against 1,000 lethal doses. It is possible that had all the 32 received this dose, the same antibody response would have resulted as from the multiple massive doses. From our experience, their antigen was not ideally antigenic, and yet the outcome of the experiment with 12,519 men, in whom repeated injections were made of 9 billion organisms of each type, was most promising for no cases of types I, II, or III pneumonia occurred in the 10-week observation period. There were 26 cases of

these types in the control group of about 20,000. This brings up the question as to whether or not increased resistance might be associated with some form of response other than serum protective antibody.

Two other examples are given in which serum antibodies were tested after repeated injections of vaccine in human beings. The first is the one of Barach (*12*) in which five human donors were used in a study of the effect of blood from immunized individuals in the treatment of pneumonia. In one study, he injected five individuals weekly with doses of vaccine varying from 1 to 25 billion organisms over different periods, two persons for 12 months, the others for 5 months, 7 months, and 6 weeks, respectively. Antibody titer varied with the individual, but even after long-continued injection of vaccine there was no indication of hyperimmunity. The highest titer found was such that 0.2 cc. of serum protected mice against 100,000 lethal doses. This titer was no higher than the average recorded above following a single injection of a small dose of whole-cell vaccine. One individual, after repeated vaccinations for 12 months, had no types I or II, and very little type III antibodies.

A third example is Ferguson's (*13*) study on three individuals after four or five repeated injections of serum antibody, irregularly spaced from 4 to 7 days. The dose varied from 50 to 200 million type I organisms. Serum was tested a month after the last injection and again in six other titrations over a period of a year. Serums from all three individuals had higher titer of antibody than reported by Cecil and Austin or Barach. However, again the serum antibody content was no higher than in many of the individuals reported in this paper after a single injection of vaccine.

Although it has been observed that the appearance of detectable antibody occurs in from 3 to 5 days after injection of the polysaccharide antigen, a 14-day interval has been chosen because it was found that in most individuals the concentration of serum antibody was then maximum and afterwards remained constant for a period of months. In the work of Cecil and Austin, and also Barach, the time for testing was approximately a week after the last injection of vaccine. Also in Ross' work (*14*) on oral immunization with pneumonia vaccine the interval of tests for serum antibody varied from 1 day to 27 days after the last feeding. In addition, with polysaccharide antigen, Francis (*9*) made tests a week after, and Finland (*15*) a week or more after injection of the antigen. This may account in part for the relatively low titer of the serum, for it has often been found that serum antibody increased between the first and second week from twofold to tenfold in titer. Because of this variation in lapse of time between injection and titration of serum, it is impossible to compare the results of different investigators on a common basis.

In the comparison between the relative activity of polysaccharide and vaccine in this study, the group tested is small; yet it would appear that there is no significant difference. Consequently, inasmuch as injections consisted of 400 to 800 mouse immunizing units of polysaccharide antigen types I and II, and only 50 and 100 of the whole-cell vaccine, it would appear that in human beings the whole-cell vaccine is more antigenic by weight than is the case with polysaccharide. Nevertheless, since an antigenic dose of polysaccharide can be injected without production of untoward reaction, in contrast to whole-cell vaccine, if any pneumococcus antigen is to be used in attempts to increase resistance of human beings to pneumococcus infection, the polysaccharide is at present the one of choice. It may be possible to isolate from the pneumococcus cell an antigen that is as active for humans as the whole cell without producing local or systemic reactions. Both polysaccharide antigen and vaccine stimulate serum antibody, being apparently alike in titer and showing similar individual variation in capacity to produce antibody. Whether or not the whole-cell vaccine is superior to polysaccharide in increasing the resistance of the host against the pneumococcus in a manner different from the polysaccharide is purely speculative and awaits proof.

There is apparently no difference between the two antigens as measured by the effect of a second dose (*7*). Evidently hyperimmunity in the human being, at least by the present methods and with present antigens, is difficult to obtain as measured by the titer of serum antibodies. In this experiment the second injection of vaccine 14 days after the first did not significantly increase serum antibody content even though the dose was doubled in the second injection. The interval of injection may have been incorrect or the antigen may have been at fault. So far the polysaccharide antigen and the whole-cell vaccine give like results as to individual variation in response and as to their relative ability to stimulate antipneumococcal immunity in man. If this individual variation represents varying degrees of susceptibility to pneumococcus infection, active immunity will be successful only when and if methods are devised to stimulate antibody alike in all individuals.

SUMMARY

Comparison was made between the antigenicity of polyvalent whole-cell vaccine of pneumococci types I and II in 79 persons and polyvalent polysaccharide antigen types I and II in 92 individuals. Vaccine was used in two doses, 225 million organisms of each type for the first and 450 million for the second. With polysaccharide antigen one dose was used containing 0.4 mg. type I and 0.2 mg. type

II. The relative activity was measured by the serum protective antibody titer and the skin test of Francis and Tillett. The results are as follows:

1. There was no significant difference found with respect to the protective titer of the serum, the individual variation in response, and the percentage of individuals who did not have detectable antibody in the blood.

2. With the doses of vaccine used at a 14-day interval between injections, there was no advantage in respect to antibody titer in the second injection.

3. The skin test was positive after immunization with vaccine when there were serum antibodies present for type I in 78.5 percent of the group, type II in 64.9 percent; with polysaccharide antigen, for type I in 89 percent and type II in 72 percent.

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OBSERVATIONS ON HOUSEHOLD ANOPHELISM IN A SELECTED GROUP OF MOSQUITO-PROOFED AND NON-MOSQUITO-PROOFED HOMES [1]

By REDGINAL HEWITT and EMIL KOTCHER

The studies described herein deal principally with data obtained during June, July, and August 1940, from the Wheeler Reservoir Area of the Tennessee Valley Authority near Decatur, Ala. Three communities in this area have been under observation during the mosquito-breeding season since the summer of 1938, and records have been kept of the amount of malaria which occurs in the region (*5*, *6*). A mosquito-proofing program was started in two of these communities in the spring of 1938 and was completed in April 1939; the houses in the third community are not mosquito-proofed. The approximate population included in the experimental areas is as follows:

Community	*Number of houses*	*Population*
Harris Station [2]	210	1,100
Cotaco Creek [2]	150	700
Buckeye Swamp [3]	180	800

It was considered desirable to determine to what extent the mosquito-proofed houses are protected against the entrance of female *Anopheles quadrimaculatus* as compared with the unscreened houses. The results of studies on household anophelism in the three communities cited form the subject of the present report.

METHODS

The three types of data obtained throughout the period of observation are:

(*a*) *Observations on household anophelism in a selected group of houses.*—Twelve houses in Harris Station, 11 houses in Cotaco Creek, and 15 houses in Buckeye Swamp were selected for study. The houses chosen were scattered throughout the communities, and in most cases were not less than one-third mile or more than one-half mile from a major anopheline breeding site. For the most part they were one-story tenant houses of reasonably comparable construction. No home selected had more than 3 bedrooms, and not less than 4 nor more than 8 people lived in any of them. Most of the houses were comparable from the standpoint of number of surrounding outbuildings and kinds of livestock kept within them.

On Monday, Tuesday, and Wednesday of each week at approximately the same time of day from June 1 to August 31, visits were

[1] From the Health and Safety Department, Tennessee Valley Authority, Wilson Dam, Ala.

[2] Houses mosquito-proofed.

[3] Houses not mosquito-proofed.

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made to all houses selected. A search was made for resting *Anopheles quadrimaculatus* in bedrooms, although in several cases storerooms and kitchens which were found to provide suitable resting places were also examined. The corners of rooms, ceilings, baseboards, and backboards of stationary furniture were the points searched particularly. All mosquitoes counted on each day were killed in their resting places with a mixture of pyrethrum in an aromatic oil base. The purpose of killing all mosquitoes counted was to insure that counts made on Tuesday and Wednesday would not include mosquitoes which might have remained in the houses from the previous day.

(*b*) *Observations on the length of time that female A. quadrimaculatus remain within mosquito-proofed and nonmosquito-proofed dwellings.*—The total counts from each of the above houses were assembled for day 1 (Monday), day 2 (Tuesday), and day 3 (Wednesday) throughout the entire month. These totals were divided by the total number of visits made to the houses in each community during the month on the particular day designated; the figures obtained represent the average number of mosquitoes counted on day 1, day 2, and day 3.

A second method directed to ascertain the length of stay of *A. quadrimaculatus* consisted of staining mosquitoes with 1 percent aqueous solutions of methylene blue and eosin-Y and releasing them in mosquito-proofed and nonmosquito-proofed houses. Catches were made on various days thereafter to determine how many of the stained mosquitoes remained in the houses.

(*c*) *Observations on the flight of mosquitoes between barns and houses.*—Stained mosquitoes were released in houses and barns not more than 75 yards apart, and catches made in both buildings on various days thereafter were tested for the presence of stain with 70 percent alcohol (tests on laboratory-stained mosquitoes proved this to be an effective method for determining the presence of stain). Aqueous methylene blue was used to stain mosquitoes released in houses, and eosin-Y in barns.

RESULTS

(*a*) *Household anophelism.*—In table 1 data are presented which show the total number of mosquitoes captured per month in houses in the three communities studied, as well as the average count of mosquitoes per house per day during the month. Throughout the month of June there was little variation between the number of mosquitoes found in the mosquito-proofed and nonmosquito-proofed houses. Comparable counts were made in all houses visited and these were for the most part exceedingly low. In July, however, considerable variation occurred between the counts made in the three communities. In Harris Station, an average number of 5.67 mosquitoes per house per day was found, but in Cotaco Creek only 2.15 mosquitoes

per house per day were counted. Buckeye Swamp showed a significantly higher daily average (8.03 mosquitoes per house per day) than did Cotaco Creek, but only slightly higher than Harris Station. The daily average count for the month of August was highest in the nonmosquito-proofed houses.

TABLE 1.—*Anopheline density in houses, 1940*

Area	Monthly total			Number of observations			Average number of mosquitoes per house per day		
	June	July	August	June	July	August	June	July	August
Harris	128	971	233	135	171	137	0.94	5.67	1.70
Cotaco	140	326	180	129	151	127	1.08	2.15	1.41
Buckeye [1]	220	1,551	1,090	168	193	172	1.25	8.03	6.33

[1] Houses not mosquito-proofed.

It should be noted that in one house in Harris Station during the month of July the total number of mosquitoes counted was 315.

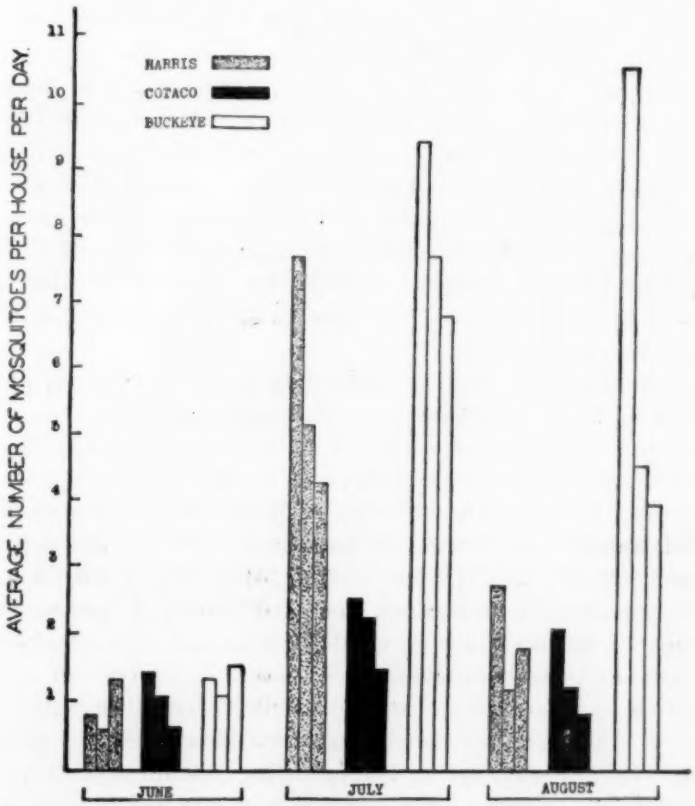

FIGURE 1.—Average number of mosquitoes per house per day in the three communities studied during June, July, and August 1940. The average counts from each community are given for Monday, Tuesday, and Wednesday of each week. The houses in Harris and Cotaco were screened; those in Buckeye were not screened.

In another the total count was 278, and in a third, 120. Thus the average count per house per day, 5.67, is weighed heavily by the findings in 3 dwellings. All of the counts in the other 9 houses were markedly lower than any of the above mentioned, and the combined total of these 9 houses for July was only 256. Similar but less pronounced variations occurred in the other two areas studied, particularly in Buckeye Swamp. No explanation can be given for this occurrence on the basis of known facts.

(*b*) *The length of time that female A. quadrimaculatus remain within mosquito-proofed and nonmosquito-proofed houses.*—The average numbers of mosquitoes captured per house per day during the months of June, July, and August are shown in figure 1. These are arranged in the order that counts were made, on Monday (day 1), Tuesday (day 2), and Wednesday (day 3) of each week. Very little significance can be attached to the differences in the number of mosquitoes found on each of these days throughout the month of June, since the variation is exceedingly small. During the month of July, however, the average number of mosquitoes found on Monday of each week in Harris Station and Buckeye Swamp was markedly higher than the counts made on Tuesday and Wednesday in the same houses. This is not strikingly shown in Cotaco Creek, since household anophelism remained at a low level in this community throughout the entire period of observation. Likewise, throughout the month of August the data show that a marked diminution occurred in the number of mosquitoes found in houses on the second and third days of each weekly visit, as compared with the first day, in both mosquito-proofed and nonmosquito-proofed houses. This seems to indicate that over a period of 1 or 2 days mosquitoes which enter houses have a tendency to accumulate in them.

A very small percentage of stained mosquitoes released in houses were recovered on following days thereafter, as shown in table 2. In series 1, for example, out of 244 stained mosquitoes released in 5 different houses, only 2 were recovered on the following day. Considering the relatively large number of mosquitoes that were released, the total number recovered on any particular day thereafter was remarkably small, and it appears that under the conditions of the series of experiments performed, most fed female *A. quadrimaculatus* do not remain within either mosquito-proofed or nonmosquito-proofed homes for long periods of time.

Out of 505 newly emerged mosquitoes [4] (about 50 percent females) released in 8 mosquito-proofed houses at different times during the day only 4 were recovered on the following morning (table 3). Only one recovery was made from a nonmosquito-proofed house.

[4] Obtained from the insectary at Wilson Dam.

(c) *The flight of mosquitoes between barns and houses.*—A total of 3,575 mosquitoes was released in 5 different barns, and only 28 of these were recovered from the same barns on the first, second, and third days thereafter. No instance of flight from barn to house was found, and only 8 instances of flight from house to barn were discovered (a total of 1,493 mosquitoes was released in houses within 75 yards of the above-mentioned barns).

TABLE 2.—*Number of A. quadrimaculatus recovered from screened and unscreened houses on various days following their release*

Number of houses included in observations	Total number of stained mosquitoes released	Total number of mosquitoes captured on days indicated							
		Total				Stained			
		1	2	3	4	1	2	3	4
Mosquito-proofed:									
5	244	15	[1]	[1]	[1]	2	[1]	[1]	[1]
5	417	109	87	[1]	[1]	24	15	[1]	[1]
5	271	56	67	[1]	[1]	7	1	[1]	[1]
5	230	[1]	26	56	[1]	0	1	1	[1]
5	395	[1]	[1]	[1]	41	[1]	[1]	[1]	0
Not mosquito-proofed:									
2	125	87	[1]	[1]	[1]	5	[1]	[1]	[1]
3	180	19	7	[1]	[1]	0	0	[1]	[1]
2	185	[1]	[1]	[1]	8	[1]	[1]	[1]	1

[1] Houses not searched on these days.

TABLE 3.—*Number of A. quadrimaculatus recovered from screened and unscreened houses on the day following the release of unfed, newly emerged females and males*

House number	Number of stained mosquitoes released	Time of release	Number of mosquitoes captured on following morning	
			Total	Stained
Mosquito-proofed:				
154	50	8:00 a. m.	None seen	
204-1	50	8:10 a. m.	None seen	
120	70	9:00 a. m.	9	[2] 1
44	30	9:20 a. m.	8	[2] 1
176-3	30	2:00 p. m.	3	0
178-1	100	2:00 p. m.	38	[3] 2
254	100	3:45 p. m.	11	0
154	75	7:15 p. m.	2	0
Total	505		71	4
Not mosquito-proofed:				
284-1	125	3:15 p. m.	30	0
389	100	7:30 p. m.	7	[3] 1
Total	225		37	1

[1] Fed female.
[2] 1 fed and 1 unfed female.
[3] Unfed female.

DISCUSSION

The data obtained from 3 successive visits each week to a selected group of mosquito-proofed and nonmosquito-proofed houses, as shown in figure 1, indicate that an accumulation of mosquitoes probably occurred in the houses for one or two days preceding the first

weekly visit, particularly during July and August. This accumulation was not as great as would be expected over a 5-day period if none of the mosquitoes which entered the houses left them soon after a blood meal was taken. Moreover, the presence of screens seemed to have no influence on the degree of accumulation, since an equal and more often greater accumulation occurred in nonmosquito-proofed houses.

In view of the large numbers of stained mosquitoes released in houses, remarkably few were recovered, and none were found beyond 4 days from the time of their release. The recoveries made in mosquito-proofed houses were not appreciably higher than those recaptured from nonmosquito-proofed homes, considering the proportionate number of mosquitoes released in each case. Barber and Hayne (*1*) make the following statement relative to this subject: "Our results indicate that *A. quadrimaculatus*, even in the case of females engorged with blood, do not under natural conditions remain long in a resting place; further, that they soon die when confined in such resting places, even when supplied with a source of blood." Darling (*2*), in reviewing contemporary entomological research in malaria, stated that observations show that *A. quadrimaculatus* may remain but a day or two within a habitation after taking a blood meal; they then leave the home for another resting place.

Frequently, during the present observations, the tenants claimed that they killed many mosquitoes in the early morning on the inside of screened doors or windows. This procedure seemed to be a common one in the areas visited and it is inferred that after securing a blood meal the mosquitoes seek a means of egress and come to rest on the screens. Those which do not escape, or are not killed, seek the darkest places in the house after daybreak, where they rest during the day (*4*).

Mosquitoes found in barns during the daytime were almost invariably fed females, most of which had probably taken their blood meals from livestock kept in the barn the preceding night. Very few mosquitoes released in barns were recovered from the same barns at any time thereafter, although it was not possible to make "total" catches on the days that recapture was attempted. A sufficient sample (from one-third to one-half the estimated total number within barns) was obtained in every case, however, to show that most of the stained mosquitoes had left the barns within 1 or 2 days from the time of their release. Newly emerged females behaved similarly in this respect. Roubaud (*3*), and Barber and Hayne (*1*) hold similar opinions relative to the quick "turn-over" of mosquito populations in their resting places. The former author was unable to recover any *A. maculipennis* which were stained in a barn 6 days previously, and experiments by the latter investigators indicated that

even though anophelines were destroyed or removed from their daytime resting places, the number found on succeeding days thereafter was as large as ever.

SUMMARY

Studies on household anophelism were made from June through August in a selected group of 38 houses surrounding Wheeler Reservoir, near Decatur, Ala. The houses chosen for observation were approximately comparable with respect to construction, size, number of occupants, number of bedrooms, number of outbuildings, livestock, and distance from anopheline breeding sites. Visits were made to these houses on Monday, Tuesday, and Wednesday of each week at approximately the same time of day. Resting female *A. quadrimaculatus* were counted and killed in their resting places. Although considerable variation occurred within different houses, in general throughout the period of observation fewer mosquitoes were found in mosquito-proofed homes than in houses not so protected.

A certain amount of accumulation of mosquitoes was demonstrated during the 5-day period preceding the first weekly visit, but this was no more evident in screened than unscreened houses. Likewise, the results obtained from staining and releasing mosquitoes in houses, with recovery on various days thereafter, did not show that the presence of screens reduced the number of mosquitoes which were able to leave the house once they had entered. Very few mosquitoes were recovered from houses or barns following their release, and little interflight occurred between barns and houses 75 yards apart.

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EFFECTIVENESS OF DERATIZATION OF SHIPS BY TRAPPING

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As a means of reducing the rat population on infested ships, trapping has been productive of excellent results at the Port of New York. During the past 3 years this activity has been made a respon-

sibility of the vessels concerned, with the Public Health Service exercising general supervision through frequent inspections and recommendations. The actual trapping has been accomplished in most part by members of each ship's crew. However, in some instances private exterminators have been employed during the vessel's stay in port.

While the examples of the effectiveness of trapping herein presented have been chosen on account of the rather spectacular results obtained, no less satisfactory accomplishments have been obtained on a very much larger number of vessels with only slight or moderate infestation. On these vessels, by persistent and continuous application of sanitary procedures in conjunction with trapping, the rat population has either been eliminated or reduced to a negligible number.

From the large number of vessels engaged in foreign trade and calling at New York, the accompanying list of 20 vessels has been chosen to illustrate the possibility of accomplishing satisfactory deratization by means of careful trapping.

TABLE 1.—*Estimated number of rats present on 20 selected vessels engaged in foreign trade and number of rats trapped under the direction of the Public Health Service at the Port of New York*

Nationality	Vessel	Net tonnage	Number of rats estimated	Number of traps set	Number of rats recovered	Number of days trapped	Remarks
Greek	S. S. A. M.	2,476	21	36	17	3	Trapping in progress at sailing time.
British	S. S. A.	4,077	15	24	11	6	Do.
Greek	S. S. A.	1,791	8	14	21	42	Do.
British	S. S. D.	2,802	15	24	15	4	Do.
Japanese	S. S. D. M.	4,383	12	20	22	6	Trapping in progress at sailing time. Final estimate 5.
Norwegian	S. S. E. S.	3,533	33	36	28	16	Trapping in progress at sailing time.
Finnish	S. S. I. R.	1,314	15	24	17	25	None trapped last 4 days.
British	S. S. K.	2,426	10	----	9	6	
British	S. S. K. I.	3,164	14	24	37	3	Trapping in progress at sailing time.
Norwegian	M. V. L.	1,886	26	36	40	5	Do.
Portuguese	S. S. L. M.	3,857	8	24	35	8	Do.
Polish	S. S. M. W.	1,911	12	41	51	8	Trapped 20 on voyage. Final inspection negative.
Greek	S. S. M. R.	3,192	16	----	27	5	Trapping in progress at sailing time.
Greek	S. S. N.	2,989	14	24	12	6	
Norwegian	S. S. N.	3,143	15	27	46	9	Final inspection negative.
Belgian	S. S. P.	3,293	15	24	15	3	Trapping in progress at sailing time.
Norwegian	S. S. S.	2,460	16	24	11	5	Do.
Egyptian	S. S. S.	1,842	25	42	30	4	
Norwegian	M. V. T. Y.	3,806	14	36	71	12	
British	S. S. W. W.	2,627	11	24	13	8	Do.
Totals	20	-------	315	----	528	----	

Average number of traps set on 18 vessels: 28.
Average number of days traps were set: 9.2.

The actual number of rats trapped is probably greater than the report indicates as only the dead rats actually collected by sanitary inspectors have been counted. It frequently happens that longshoremen or members of the ship's crew throw the bodies overboard

before they can be collected by a designated crew member or the sanitary inspector. On the other hand, the number of rats estimated is frequently less than the number actually present on board. This is due in many cases to the fact that the vessels are fully loaded with inbound cargo at the time of the inspection and only the rat evidence on the top of the cargo can be seen.

During the 12-month period ended February 1, 1941, 2,910 rats were recovered as a result of trapping operations on vessels entering the Port of New York. This did not include a considerable, but unverified, number reported trapped at sea.

As none of the rats included in the present account were trapped by employees of the United States Public Health Service, it will be seen that the results represent commendable cooperation on the part of the ship's crew.

To obtain satisfactory results from trapping, a considerable expenditure of effort is required in educating designated members of crews of infested vessels. At the Port of New York this is mostly accomplished by instruction imparted by sanitary inspectors to the personnel of vessels and also by the distribution of printed instructions on trapping [1] to chief officers and others concerned.

In this connection it is desired to emphasize the general importance of ship sanitation, including elimination of rat harborages and of waste food products as a necessary adjunct to deratization by trapping. Hunger resulting from deprivation of the customary food supply, and the disturbance of rats' harboring and nesting places by the application of appropriate sanitary measures greatly increase the effectiveness of trapping.

From our experience we conclude that supervised trapping on infested vessels, from the first United States port of call until the vessel is completely deratized or sails for a foreign port, is producing effective results.

DEATHS DURING WEEK ENDED MAY 3, 1941

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended May 3, 1941	Corresponding week, 1940
Data from 88 large cities of the United States:		
Total deaths	8,282	8,459
Average for 3 prior years	8,238	
Total deaths, first 18 weeks of year	166,242	166,714
Deaths per 1,000 population, first 18 weeks of year, annual rate	12.9	12.9
Deaths under 1 year of age	477	496
Average for 3 prior years	502	
Deaths under 1 year of age, first 18 weeks of year	9,620	9,198
Data from industrial insurance companies:		
Policies in force	64,542,842	65,621,263
Number of death claims	12,336	12,312
Death claims per 1,000 policies in force, annual rate	10.0	9.8
Death claims per 1,000 policies, first 18 weeks of year, annual rate	10.6	10.6

[1] Trapping rats on ships. Pub. Health Rep., 55: 1057-1061 (June 14, 1940). (Reprint No. 2170.)

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED MAY 10, 1941

Summary

The number of reported cases of measles dropped to 39,754 as compared with 43,880 for the preceding week, making the third successive week in which a decreased incidence has been reported. The total number of cases reported to date (first 19 weeks), 623,017, now exceeds the number reported for the corresponding period of any other year since 1919 and is possibly higher than the figure for any prior year for which corresponding reports are available.

A total of 22 cases of poliomyelitis was reported, as compared with 20 for the preceding week, with 14 in 1940, and with a 5-year (1936–40) median of 19. During the corresponding week of the 5 preceding years the current incidence was exceeded only in 1939. For the current week 6 cases were reported in Florida and 3 cases each in New York State and California. Of 446 cases reported to date this year, 110 cases have been reported in the South Atlantic area, 52 cases in Florida of which 36 occurred in Dade County.

In addition to measles, the cumulative totals for influenza and poliomyelitis are above the 5-year median expectancy and for whooping cough higher than for any year since 1937.

One case of psittacosis was reported in Chester County, Pennsylvania, and one plague-infected ground squirrel was reported found in Kern County, California.

Three cases of tularemia, 17 cases of Rocky Mountain spotted fever, and 27 cases of endemic typhus fever were reported.

The death rate for the current week (annual basis) in 88 major cities was 11.6 per 1,000 population, the same as for each of the two preceding weeks and slightly below the 3-year (1938–40) average of 11.7. The cumulative rate for the first 19 weeks (annual basis) is 12.8, as compared with 12.9 for the corresponding period last year.

Telegraphic morbidity reports from State health officers for the week ended May 10, 1941, and comparison with corresponding week of 1940 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, meningococcus		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	May 10, 1941	May 11, 1940		May 10, 1941	May 11, 1940		May 10, 1941	May 11, 1940		May 10, 1941	May 11, 1940	
NEW ENG.												
Maine	1	0	1	1	1	1	51	454	134	1	0	0
New Hampshire	0	0	0	2	-----	-----	48	38	38	0	0	0
Vermont	3	0	0	-----	-----	-----	66	12	142	0	0	0
Massachusetts	4	4	4	-----	-----	-----	848	713	763	5	1	1
Rhode Island	0	0	0	-----	-----	-----	8	159	76	0	0	0
Connecticut	1	2	5	-----	1	1	422	54	249	1	0	0
MID. ATL.												
New York [1]	20	23	38	[3]5	[3]16	[3]8	4,257	945	2,320	7	6	6
New Jersey	3	6	9	10	5	5	2,527	759	759	1	0	0
Pennsylvania [3]	13	20	21	-----	-----	-----	5,534	417	1,114	1	4	4
E. NO. CEN.												
Ohio	6	17	17	10	44	44	4,017	22	333	1	1	2
Indiana	13	1	7	1	6	8	1,026	22	23	1	0	0
Illinois	30	17	32	-----	7	21	2,013	198	198	3	1	3
Michigan [4]	4	3	8	11	7	5	3,027	661	481	2	0	1
Wisconsin	0	2	2	30	65	37	1,800	776	776	0	0	0
W. NO. CEN.												
Minnesota	4	1	2	-----	2	2	31	135	239	2	0	1
Iowa	0	3	3	17	-----	3	246	260	147	0	0	0
Missouri	1	12	12	6	2	15	569	24	39	0	2	2
North Dakota	0	0	1	1	6	15	21	5	5	0	0	0
South Dakota [5]	1	1	1	1	1	-----	10	1	1	0	0	0
Nebraska	0	1	2	-----	-----	-----	35	23	23	0	0	0
Kansas	9	6	6	7	3	3	905	509	83	0	2	2
SO. ATL.												
Delaware	0	0	1	-----	-----	-----	98	0	19	0	0	0
Maryland [4] [5]	2	0	2	5	2	5	356	5	241	5	0	2
Dist. of Col.	1	4	4	1	-----	-----	257	5	104	0	0	0
Virginia [1]	4	9	9	243	114	114	1,656	298	353	4	3	3
West Virginia [4]	5	4	4	14	20	23	777	88	76	1	3	3
North Carolina [1]	8	5	12	1	-----	6	1,688	227	237	2	1	2
South Carolina [1]	4	2	6	213	303	142	595	38	74	0	0	1
Georgia [1]	3	4	5	35	56	-----	470	144	74	0	1	1
Florida [1]	0	1	3	11	1	4	547	166	137	0	0	1
E. SO. CEN.												
Kentucky	5	4	7	8	12	9	875	120	120	3	12	9
Tennessee [1]	3	2	6	35	42	77	685	181	105	3	2	3
Alabama [1]	6	3	7	57	47	47	391	103	103	0	0	2
Mississippi [1] [4]	9	5	5	-----	-----	-----	-----	-----	-----	2	2	0
W. SO. CEN.												
Arkansas	2	3	6	21	46	50	301	120	55	2	0	0
Louisiana	1	3	9	6	3	8	43	11	13	1	0	2
Oklahoma	6	5	5	47	40	40	190	13	60	1	0	0
Texas [1]	18	26	27	511	335	335	1,456	1,574	506	0	3	3
MOUNTAIN												
Montana [5]	1	2	2	4	31	2	35	57	42	0	0	0
Idaho	1	0	0	-----	-----	6	28	33	33	0	1	0
Wyoming [5]	0	0	1	-----	1	-----	80	14	19	0	0	0
Colorado	9	3	6	23	4	-----	526	47	47	0	1	1
New Mexico	0	0	1	1	11	6	272	63	38	0	0	0
Arizona	2	1	1	55	73	39	78	73	66	0	0	0
Utah [4] [5]	0	0	0	6	3	-----	64	635	86	1	0	0
Nevada	0	-----	-----	23	-----	-----	105	-----	-----	0	-----	-----
PACIFIC												
Washington	0	0	1	-----	1	-----	42	659	330	1	0	0
Oregon	3	5	4	7	12	18	266	572	67	0	0	0
California	7	17	23	29	63	63	412	373	640	2	0	3
Total	213	227	381	1,458	1,386	1,386	39,754	11,806	13,568	53	46	62
19 weeks	5,258	6,412	9,258	586,072	162,162	143,546	623,017	139,147	181,394	939	784	1,842

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended May 10, 1941, and comparison with corresponding week of 1940 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40	Week ended—		Median 1936–40
	May 10, 1941	May 11, 1940		May 10, 1941	May 11, 1940		May 10, 1941	May 11, 1940		May 10, 1941	May 11, 1940	
NEW ENG.												
Maine	0	0	0	12	9	9	0	0	0	0	0	0
New Hampshire	0	0	0	6	1	5	0	0	0	0	0	0
Vermont	0	0	0	3	4	7	0	0	0	0	0	0
Massachusetts	0	0	0	183	153	233	0	0	0	4	4	1
Rhode Island	0	0	0	18	8	13	0	0	0	0	0	0
Connecticut	0	0	0	67	106	106	0	0	0	2	2	1
MID. ATL.												
New York [1]	3	0	0	480	1,091	904	0	0	0	5	6	7
New Jersey	1	0	0	287	449	261	0	0	0	1	2	2
Pennsylvania [2]	1	1	1	402	467	381	0	0	0	4	7	7
E. NO. CEN.												
Ohio	0	0	0	297	380	371	0	0	0	3	4	4
Indiana	0	0	0	82	107	129	1	1	21	3	0	1
Illinois	0	1	1	340	676	575	4	2	18	5	2	3
Michigan [4]	0	0	1	263	335	350	5	2	2	0	1	2
Wisconsin	0	1	0	98	131	146	7	1	4	0	2	1
W. NO. CEN.												
Minnesota	0	0	0	39	56	149	0	1	7	0	1	2
Iowa	0	0	0	27	61	91	9	13	31	0	1	2
Missouri	0	0	0	138	65	65	1	7	7	1	1	1
North Dakota	0	0	0	5	2	23	3	2	5	2	0	0
South Dakota [5]	0	0	0	15	7	16	0	1	5	0	0	0
Nebraska	0	0	0	12	24	47	0	4	6	0	0	0
Kansas	0	1	0	42	55	83	2	0	9	1	3	1
SO. ATL.												
Delaware	0	0	0	15	5	3	0	0	0	0	0	0
Maryland [4 6]	1	0	0	51	28	33	0	0	0	2	1	2
Dist. of Col	0	0	0	5	47	17	0	0	0	0	0	0
Virginia [1]	0	0	0	41	30	21	0	0	0	3	4	4
West Virginia [4]	0	2	0	46	27	30	0	0	0	9	2	3
North Carolina [1]	0	0	1	9	20	22	0	0	0	0	2	3
South Carolina [1]	0	1	0	5	3	3	0	1	0	5	2	3
Georgia [1]	0	1	1	19	11	7	0	0	0	4	3	5
Florida [1]	6	0	0	1	6	7	0	0	0	12	1	4
E. SO. CEN.												
Kentucky	0	0	0	98	76	46	0	0	1	4	8	4
Tennessee [1]	1	0	0	66	55	20	0	0	0	7	0	3
Alabama [1]	0	0	1	15	8	6	0	0	0	1	5	5
Mississippi [1 6]	2	0	1	1	3	5	0	0	0	3	1	2
W. SO. CEN.												
Arkansas	0	0	0	6	13	8	0	0	1	2	6	3
Louisiana	1	0	0	3	5	10	0	0	0	1	1	9
Oklahoma	1	0	0	19	15	21	0	1	1	2	1	2
Texas [1]	1	1	1	57	24	63	5	2	5	6	9	9
MOUNTAIN												
Montana [4]	0	0	0	18	21	21	0	0	8	0	2	1
Idaho	0	0	0	6	5	9	0	0	1	1	1	0
Wyoming [5]	0	0	0	9	14	7	0	0	0	0	0	0
Colorado	0	0	0	25	34	47	0	7	7	2	1	1
New Mexico	0	0	0	6	4	21	0	0	0	0	0	1
Arizona	0	0	0	2	15	15	0	0	0	0	2	2
Utah [4 6]	0	0	0	11	16	21	0	1	1	1	0	0
Nevada	0	----	----	2	----	----	0	----	----	1	----	----
PACIFIC												
Washington	0	0	0	11	55	38	0	1	6	3	2	2
Oregon	1	0	0	8	17	21	0	0	19	2	0	1
California	3	5	3	117	143	177	0	1	4	4	9	9
Total	22	14	19	3,488	4,887	4,887	37	48	272	106	99	129
19 weeks	446	441	375	70,248	91,674	109,484	858	1,380	5,987	1,481	1,560	2,119

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended May 10, 1941, and comparison with corresponding week of 1940—Continued

Division and State	Whooping cough	
	Week ended—	
	May 10, 1941	May 11, 1940
NEW ENG.		
Maine	30	8
New Hampshire	114	32
Vermont	17	37
Massachusetts	215	179
Rhode Island	15	4
Connecticut	51	27
MID. ATL.		
New York [1]	289	346
New Jersey	105	114
Pennsylvania [3]	362	313
E. NO. CEN.		
Ohio	388	218
Indiana	36	26
Illinois	99	95
Michigan [4]	420	199
Wisconsin	134	94
W. NO. CEN.		
Minnesota	130	36
Iowa	65	26
Missouri	55	44
North Dakota	33	11
South Dakota [5]	31	0
Nebraska	7	16
Kansas	129	39
SO. ATL		
Delaware	1	1
Maryland [4] [5]	102	125
Dist. of Col	20	12
Virginia [1]	90	48
West Virginia [4]	48	85
North Carolina [1]	300	109
South Carolina [1]	148	23
SO. ATL.—continued		
Georgia [1]	28	21
Florida [1]	9	11
E. SO. CEN.		
Kentucky	59	78
Tennessee [1]	64	62
Alabama [1]	51	18
Mississippi [4]	----	----
W. SO. CEN.		
Arkansas	50	19
Louisiana	36	31
Oklahoma	42	8
Texas [1]	429	344
MOUNTAIN		
Montana [5]	17	1
Idaho	31	20
Wyoming [5]	1	6
Colorado	189	16
New Mexico	23	62
Arizona	28	38
Utah [4] [5]	50	190
Nevada	10	----
PACIFIC		
Washington	169	49
Oregon	8	29
California	726	479
Total	5,454	3,754
19 weeks	85,488	58,956

[1] Typhus fever, week ended May 10, 1941, 27 cases, as follows: New York, 3; Virginia, 2; North Carolina, 1; South Carolina, 1; Georgia, 3; Florida, 5; Tennessee, 1; Alabama, 6; Mississippi, 1; Texas, 4.

[3] New York City only.

[4] Psittacosis, week ended May 10, 1941, Pennsylvania, Chester County, 1 case.

[4] Period ended earlier than Saturday.

[5] Rocky Mountain spotted fever, week ended May 10, 1941, 17 cases, as follows: South Dakota, 2; Maryland, 3; Montana, 7; Wyoming, 3; Utah 2.

PLAGUE INFECTION IN GROUND SQUIRREL IN KERN COUNTY, CALIF.

Under date of May 7, 1941, Dr. Harlan L. Wynns, of the California Department of Public Health, reported plague infection proved by animal inoculation in a ground squirrel, *C. beecheyi*, submitted to the laboratory on April 29, 1941, from a ranch 7 miles south and 5 miles west of Techachapi, Kern County, Calif.

WEEKLY REPORTS FROM CITIES

City reports for week ended April 26, 1941

This table summarizes the reports received weekly from a selected list of 140 cities for the purpose of showing a cross section of the current urban incidence of the communicable diseases listed in the table.

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Data for 90 cities:											
5-year average	115	157	57	5,175	614	2,044	19	388	22	1,226	----
Current week [1]	63	351	27	14,392	359	1,293	1	370	14	1,399	----
Maine:											
Portland	0	----	0	5	4	1	0	0	0	1	34
New Hampshire:											
Concord	0	----	0	0	1	0	0	0	0	0	8
Manchester	0	----	0	0	1	0	0	0	0	0	16
Nashua	0	----	0	0	0	0	0	0	0	7	5
Vermont:											
Barre	0	----	0	0	1	0	0	0	0	0	5
Burlington	0	----	0	3	0	0	0	0	0	0	9
Rutland	0	----	0	0	0	0	0	0	0	0	8
Massachusetts:											
Boston	0	----	0	376	7	70	0	14	3	45	199
Fall River	0	----	0	6	0	4	0	2	0	0	37
Springfield	0	----	0	39	0	20	0	1	0	13	37
Worcester	0	----	0	52	6	12	0	3	0	0	60
Rhode Island:											
Pawtucket	0	----	0	0	1	0	0	0	0	0	14
Providence	3	----	0	0	1	5	0	2	0	20	53
Connecticut:											
Bridgeport	0	----	0	7	1	3	0	1	0	3	36
Hartford	0	----	0	3	1	12	0	1	0	11	28
New Haven	0	----	0	1	2	22	0	1	0	1	35
New York:											
Buffalo	0	----	2	123	5	21	0	3	0	20	110
New York	11	12	1	4,600	74	258	0	73	4	88	1,387
Rochester	0	----	0	148	0	1	0	1	0	18	59
Syracuse	0	----	0	0	5	4	0	3	0	7	48
New Jersey:											
Camden	1	----	0	14	0	9	0	0	0	5	27
Newark	0	2	1	155	7	15	0	7	0	18	92
Trenton	0	----	0	54	2	30	0	3	0	2	37
Pennsylvania:											
Philadelphia	4	3	3	1,111	24	153	0	21	3	65	467
Pittsburgh	0	5	3	1,039	8	18	0	8	1	46	141
Reading	0	----	0	69	1	4	0	0	0	3	21
Scranton	0	----	0	41	0	0	0	0	0	2	----
Ohio:											
Cincinnati	0	----	0	294	1	12	0	7	0	6	112
Cleveland	2	2	0	305	9	33	0	10	0	83	185
Columbus	0	1	1	183	2	19	0	4	0	4	79
Toledo	0	1	1	211	5	6	0	5	0	22	72
Indiana:											
Anderson	0	----	0	10	0	1	0	0	0	0	11
Fort Wayne	0	----	0	32	1	0	0	0	0	8	25
Indianapolis	5	----	0	314	9	17	0	4	0	15	89
Muncie	0	----	0	49	0	8	0	0	0	1	11
South Bend	0	----	0	40	0	1	0	0	0	1	16
Terre Haute	0	----	0	0	2	0	0	1	0	0	26
Illinois:											
Alton	0	----	0	4	2	1	0	0	0	0	14
Chicago	3	1	0	757	25	146	0	43	0	29	722
Elgin	1	----	0	83	0	0	0	0	0	0	4
Moline	0	----	0	36	0	0	0	0	0	2	13
Springfield	1	1	1	9	1	6	0	0	0	0	23
Michigan:											
Detroit	1	----	1	924	8	100	0	17	0	153	257
Flint	0	----	0	197	2	1	0	0	0	6	22
Grand Rapids	0	----	0	420	2	7	0	0	0	7	28
Wisconsin:											
Kenosha	0	----	0	181	0	0	0	0	0	0	11
Madison	0	----	0	8	0	4	0	0	0	2	10
Milwaukee	0	1	1	523	7	25	0	3	0	27	120
Racine	0	----	0	38	0	1	0	0	0	2	11
Superior	0	----	0	0	0	0	0	0	0	10	10

[1] Morbidity figures for Wheeling estimated; report not received.

City reports for week ended April 26, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Minnesota:											
Duluth	0		0	0	2	0	0	0	0	26	19
Minneapolis	2		0	22	2	12	0	1	0	38	116
St. Paul	0		0	3	0	8	0	1	0	25	55
Iowa:											
Cedar Rapids	0			18		3	0		0	0	
Davenport	0			4		1	0		0	1	
Des Moines	0			11		3	0		0	6	33
Sioux City	0			9		0	0		0	5	
Waterloo	0			29		1	0		0	2	
Missouri:											
Kansas City	0		0	109	6	9	0	1	0	18	94
St. Joseph	0		1	18	4	2	0	0	0	2	25
St. Louis	0	3	0	322	9	82	0	3	0	37	284
North Dakota:											
Fargo	0		0	0	1	0	0	0	0	12	11
Grand Forks	0			1		0	0		0	0	
Minot	6			8		0	0		0	1	9
South Dakota:											
Aberdeen	0			0		0	0		0	0	
Sioux Falls	0			0		7	0		0	0	
Nebraska:											
Lincoln	0			2		2	0		0	0	
Omaha	1		0	7	0	1	0	0	0	1	55
Kansas:											
Lawrence	0			13		2	0		0	2	4
Topeka	0		0	183	2	4	0	1	0	6	20
Wichita	0		0	6	3	0	0	1	0	12	27
Delaware:											
Wilmington	0		0	43	2	11	0	1	0	1	33
Maryland:											
Baltimore	0	11	2	149	21	19	0	13	0	71	244
Cumberland	0	1	0	3	0	0	0	0	0	4	10
Frederick	0		0	0	0	1	0	0	0	0	4
Dist. of Col.:											
Washington	0		0	265	13	8	0	13	1	22	167
Virginia:											
Lynchburg	2		0	2	0	0	0	0	0	0	8
Norfolk	0		0	147	4	1	0	1	1	2	26
Richmond	0		1	84	4	0	0	1	0	0	44
Roanoke	0		0	27	3	0	0	0	0	0	19
West Virginia:											
Charleston	0	1	0	2	2	0	0	1	1	0	16
Huntington	0			161		0	0		0	5	
Wheeling			0		1			0			19
North Carolina:											
Gastonia	0			27		0	0		0	1	
Raleigh	0		0	65	3	0	0	3	0	19	21
Wilmington	0		0	12	2	0	0	0	0	8	8
Winston-Salem	0	1	0	23	0	1	0	1	0	23	16
South Carolina:											
Charleston	0	1	0	23	1	0	0	0	0	0	11
Florence	0	5	0	4	0	0	0	1	0	4	7
Greenville	0		0	13	2	0	0	0	0	8	10
Georgia:											
Atlanta	0	2	0	21	2	2	0	10	0	1	67
Brunswick	0		0	16	0	0	0	0	0	0	5
Savannah	0	272	0	29	3	0	0	2	0	3	40
Florida:											
Miami	0	3	1	17	0	2	0	1	0	5	47
St. Petersburg	1		0	87	1	1	0	0	0	0	22
Tampa	0		0	0	1	1	0	0	0	5	29
Kentucky:											
Ashland	1		0	7	0	0	0	1	0	2	7
Covington	0		0	10	0	8	0	1	0	0	14
Lexington	0		0	6	0	4	0	1	0	6	17
Louisville	0		0	930	8	43	0	2	0	11	79
Tennessee:											
Knoxville	0		0	71	2	7	0	2	0	1	22
Memphis	1		0	126	1	1	0	5	0	12	67
Nashville	0		1	77	6	3	0	0	0	0	43
Alabama:											
Birmingham	1		1	146	2	9	0	2	0	1	60
Mobile	0	2	1	2	1	0	0	0	0	0	17
Montgomery	0			23		1	0		0	2	
Arkansas:											
Fort Smith	0			162		0	0		0	0	
Little Rock	0		0	27	6	0	0	1	0	5	40

City reports for week ended April 26, 1941—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Louisiana:											
Lake Charles	0	----	0	2	0	0	0	0	0	0	3
New Orleans	5	2	1	18	4	3	1	10	0	6	132
Shreveport	0	----	0	2	2	0	0	1	0	0	27
Oklahoma:											
Oklahoma City	0	3	0	3	2	2	0	1	0	0	43
Tulsa	0	----	0	53	3	0	0	0	0	11	33
Texas:											
Dallas	2	----	0	34	1	6	0	2	0	7	60
Fort Worth	0	----	0	41	1	0	0	0	0	3	33
Galveston	0	----	0	7	1	0	0	0	0	0	14
Houston	4	----	1	1	1	1	0	6	1	0	74
San Antonio	0	2	2	3	3	1	0	9	0	1	61
Montana:											
Billings	0	----	0	0	0	1	0	0	0	0	9
Great Falls	0	----	0	2	1	1	0	0	0	0	10
Helena	0	----	0	2	0	0	0	0	0	0	1
Missoula	0	----	0	0	1	0	0	0	0	0	14
Idaho:											
Boise	0	----	0	11	0	0	0	0	0	0	4
Colorado:											
Colorado Springs	0	----	0	4	0	3	0	0	0	10	6
Denver	7	6	0	316	2	3	0	6	0	125	77
Pueblo	0	----	0	4	1	2	0	0	0	33	7
New Mexico:											
Albuquerque	0	----	0	59	2	0	0	0	0	0	11
Arizona:											
Phoenix	0	28	----	3	----	1	0	----	0	3	----
Utah:											
Salt Lake City	1	----	0	13	1	1	0	0	0	13	38
Washington:											
Seattle	2	----	0	3	2	2	0	5	0	21	103
Spokane	0	----	0	9	1	7	0	1	0	4	38
Tacoma	0	----	0	2	0	0	0	0	0	4	40
Oregon:											
Portland	1	----	0	12	1	5	0	1	0	0	56
Salem	0	----	----	4	----	1	0	----	0	0	----
California:											
Los Angeles	2	18	1	49	7	47	0	21	0	47	372
Sacramento	0	1	1	5	2	2	0	1	0	37	31
San Francisco	2	----	0	6	7	10	0	14	0	30	176

State and city	Meningitis, meningococcus		Poliomyelitis cases	State and city	Meningitis, meningococcus		Poliomyelitis cases
	Cases	Deaths			Cases	Deaths	
Massachusetts:				Maryland:			
Boston	1	1	0	Baltimore	1	0	0
Springfield	1	0	0	South Carolina:			
Worcester	1	1	0	Charleston	1	0	0
New York:				Florida:			
New York	2	1	0	Miami	0	0	2
Pennsylvania:				Louisiana:			
Philadelphia	1	1	0	Shreveport	0	1	0
Pittsburgh	2	0	0	California:			
Ohio:				Los Angeles	1	0	0
Cleveland	1	0	1				
Illinois:							
Chicago	3	0	0				

Encephalitis, epidemic or lethargic.—Cases: Norfolk, 1. Deaths: Norfolk, 1.
Pellagra.—Cases: Baltimore, 1; Washington, 1; Savannah, 2; Montgomery, 1; New Orleans, 1.
Typhus fever.—Cases: New York, 1; New Orleans, 1.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended April 5, 1941.—During the week ended April 5, 1941, cases of certain communicable diseases were reported by the Department of Pensions and National Health of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis	1	13	3	2	12	2		3	4	40
Chickenpox		1	2	101	147	32	19	23	57	382
Diphtheria	2	16	2	21		1	2	1		45
Dysentery				1						1
Influenza	1	31			3	1			18	54
Measles		203	61	299	1,023	83	152	188	835	2,844
Mumps		10		214	289	56	33	9	43	654
Pneumonia		23			6	1	3		7	40
Poliomyelitis								1		1
Scarlet fever		27	9	93	193	10	5	9	18	364
Smallpox							6			6
Tuberculosis	4	4	5	84	38		19			154
Typhoid and paratyphoid fever			1	9	2					12
Whooping cough				102	136	1	2	10	21	272

FINLAND

Communicable diseases—4 weeks ended February 28, 1941.—During the 4 weeks ended February 28, 1941, cases of certain communicable diseases were reported in Finland as follows:

Disease	Cases	Disease	Cases
Diphtheria	227	Poliomyelitis	5
Dysentery	1	Scarlet fever	466
Influenza	4,146	Typhoid fever	46
Paratyphoid fever	177		

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SCOTLAND

Vital statistics—Quarter ended December 31, 1940.—Following are provisional vital statistics for Scotland for the quarter ended December 31, 1940:

	Number	Rate per 1,000 population		Number	Rate per 1,000 population
Marriages	12,999	10.3	Deaths from—Continued.		
Births	19,839	15.7	Heart disease	3,850	
Deaths	16,628	13.2	Influenza	81	0.06
Deaths under 1 year of age	1,509	[1] 76	Measles	65	.05
Deaths from:			Nephritis, acute and chronic	383	
Appendicitis	72		Pneumonia (all forms)	704	.56
Cancer	2,130	1.68	Puerperal sepsis	29	
Cerebral hemorrhage and apoplexy	1,089		Scarlet fever	7	.01
Cerebrospinal fever	79	.06	Senility	573	
Cirrhosis of the liver	43		Suicide	87	
Diabetes mellitus	223		Tuberculosis (all forms)	918	.73
Diarrhea and enteritis (under 2 years of age)	191		Typhoid and paratyphoid fever	5	
Diphtheria	233	.18	Whooping cough	77	.06

[1] Per 1,000 live births.

Vital statistics—Year 1940.—Following are provisional vital statistics for Scotland for the year 1940:

	Number	Rate per 1,000 population		Number	Rate per 1,000 population
Marriages	53,599	10.6	Deaths from—Continued.		
Births	86,389	17.1	Heart disease	16,502	
Deaths	72,775	14.9	Influenza	1,801	
Deaths under 1 year of age	6,766	[1] 78.0	Measles	262	
Deaths from:			Nephritis, acute and chronic	1,742	
Appendicitis	316		Pneumonia (all forms)	4,240	
Cancer	8,259		Puerperal sepsis	99	
Cerebral hemorrhage and apoplexy	7,160		Scarlet fever	35	
Cerebrospinal fever	482		Senility	2,534	
Cirrhosis of the liver	173		Suicide	400	
Diabetes mellitus	918		Tuberculosis (all forms)	4,003	0.82
Diarrhea and enteritis (all ages)	946		Typhoid and paratyphoid fever	27	
Diphtheria	676		Whooping cough	197	

[1] Per 1,000 live births.

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—A cumulative table giving current information regarding the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS of April 25, 1941, pages 924-928. A similar table will appear in future issues of the PUBLIC HEALTH REPORTS for the last Friday of each month.

Yellow Fever

Colombia.—Yellow fever has been reported in Colombia as follows: Antioquia Department, January 12, 1941, 1 death; Boyaca Department, April 11, 1941, 1 death.

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